Monitoring Haze

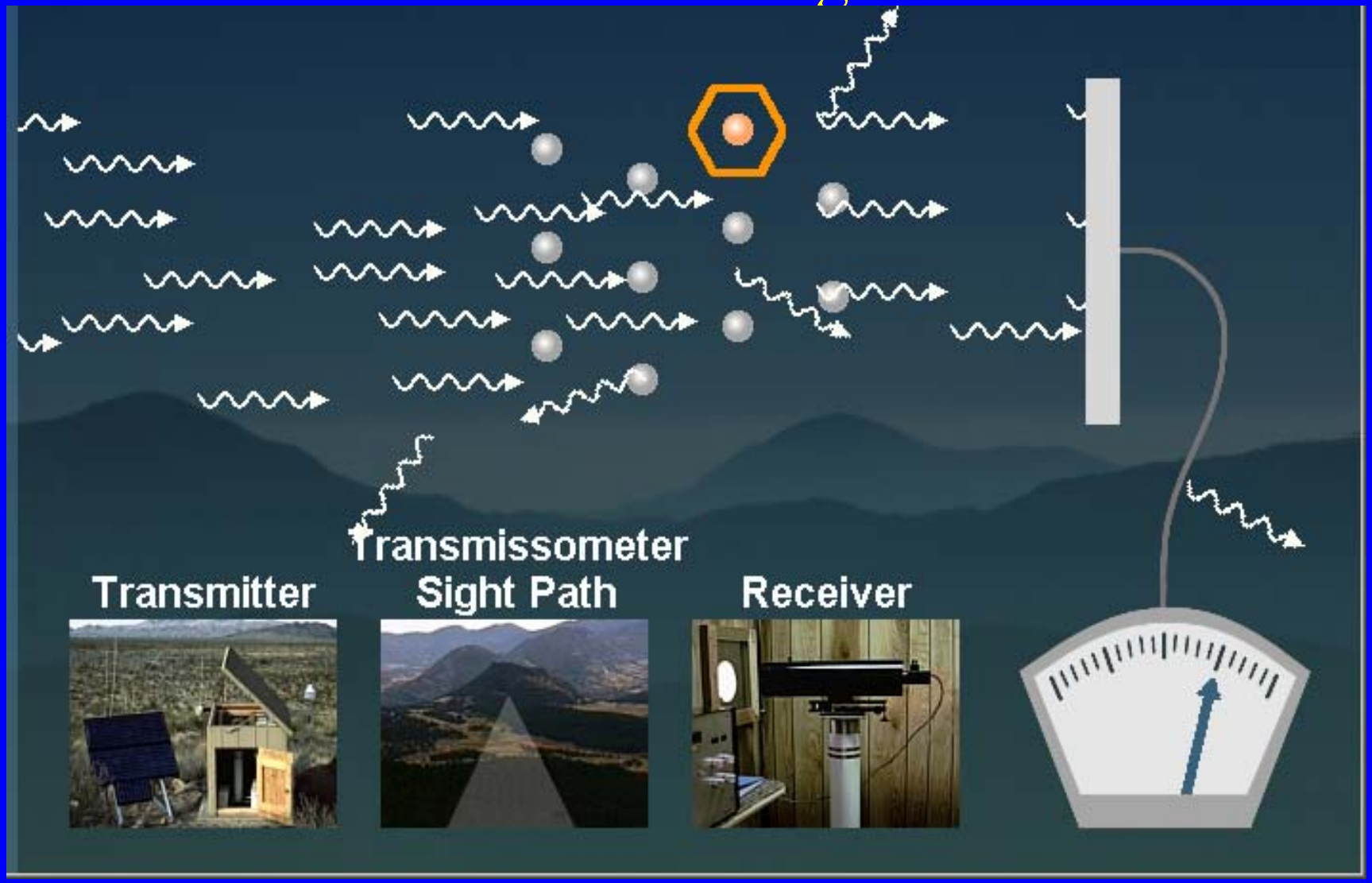
- **Transmissometer -b_{ext}**
- **Nephelometer - b_{sp}**
- **photography - Scene**
- **Aerosol Sampling – Aerosol concentrations**
- **Human Observation – Visual Range**

IMPROVE Monitoring

- Monitoring Began in March 1988
- **Optical** – extinction by ***transmissometer*** &/or scattering by ***nephelometer*** (hourly) plus absorption on particle filters (24-hour)
- **Aerosol** – ***particle sampling/analysis*** for six major species & trace constituents to aid in source attribution (24 hour samples twice weekly; every 3rd day starting in 2000)
- **Scene** – color ***photography*** to document scenic appearance (typically 3 photos/day)

Transmissometer

Path Measurement of Light Extinction

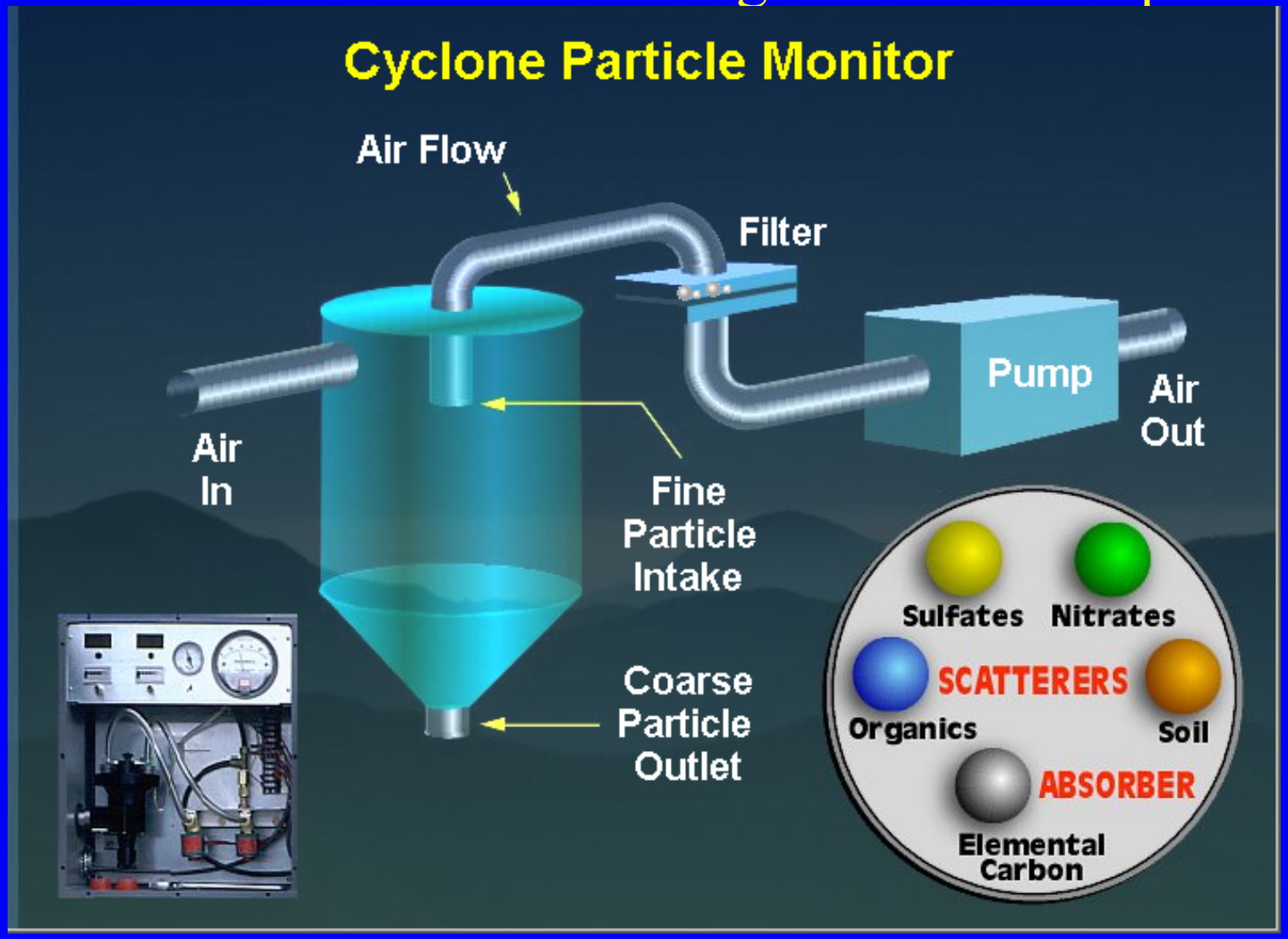


Integrating Nephelometer

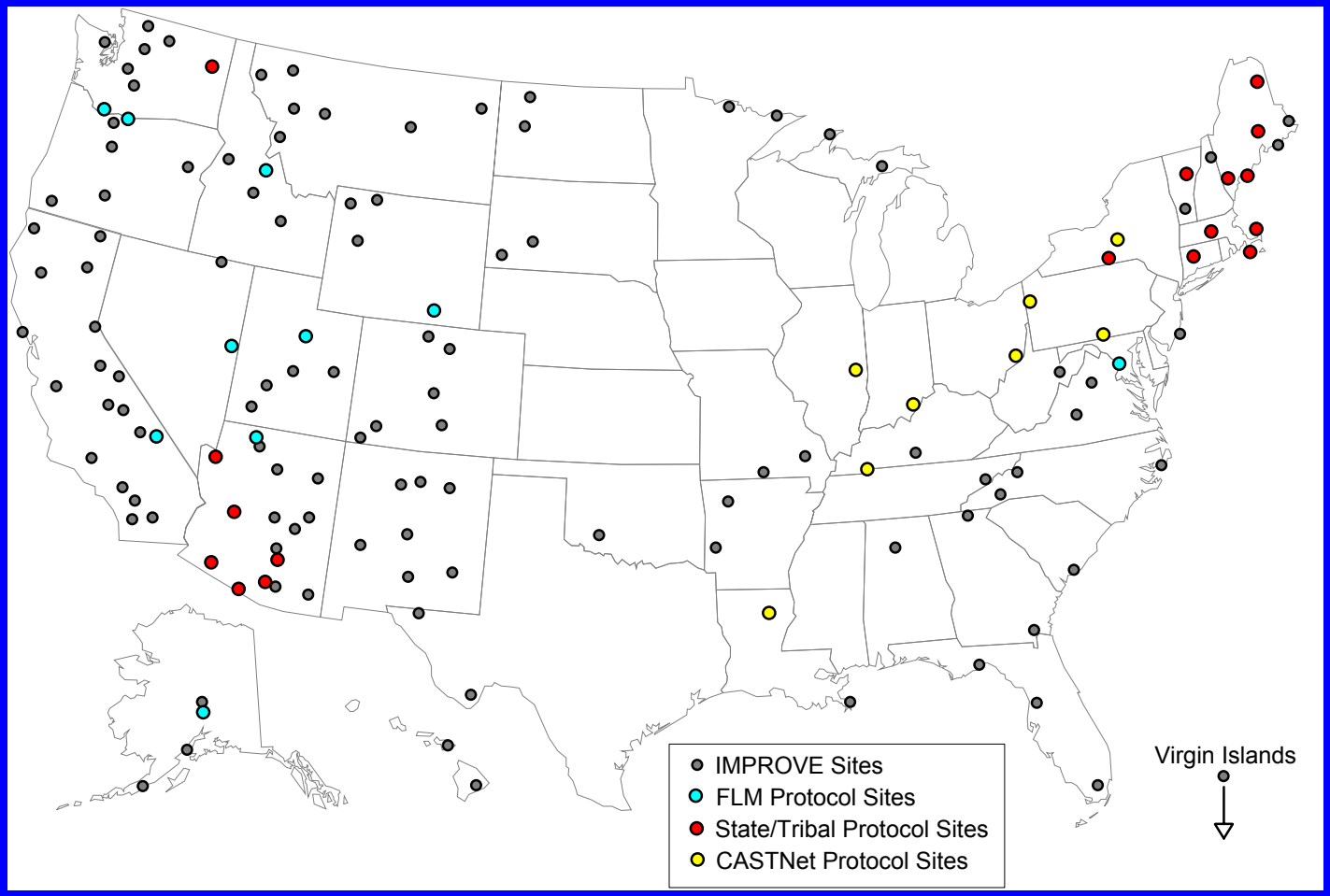
Point Measurement of Light Scattering

Aerosol Monitor

Point measurement of integrated time sample



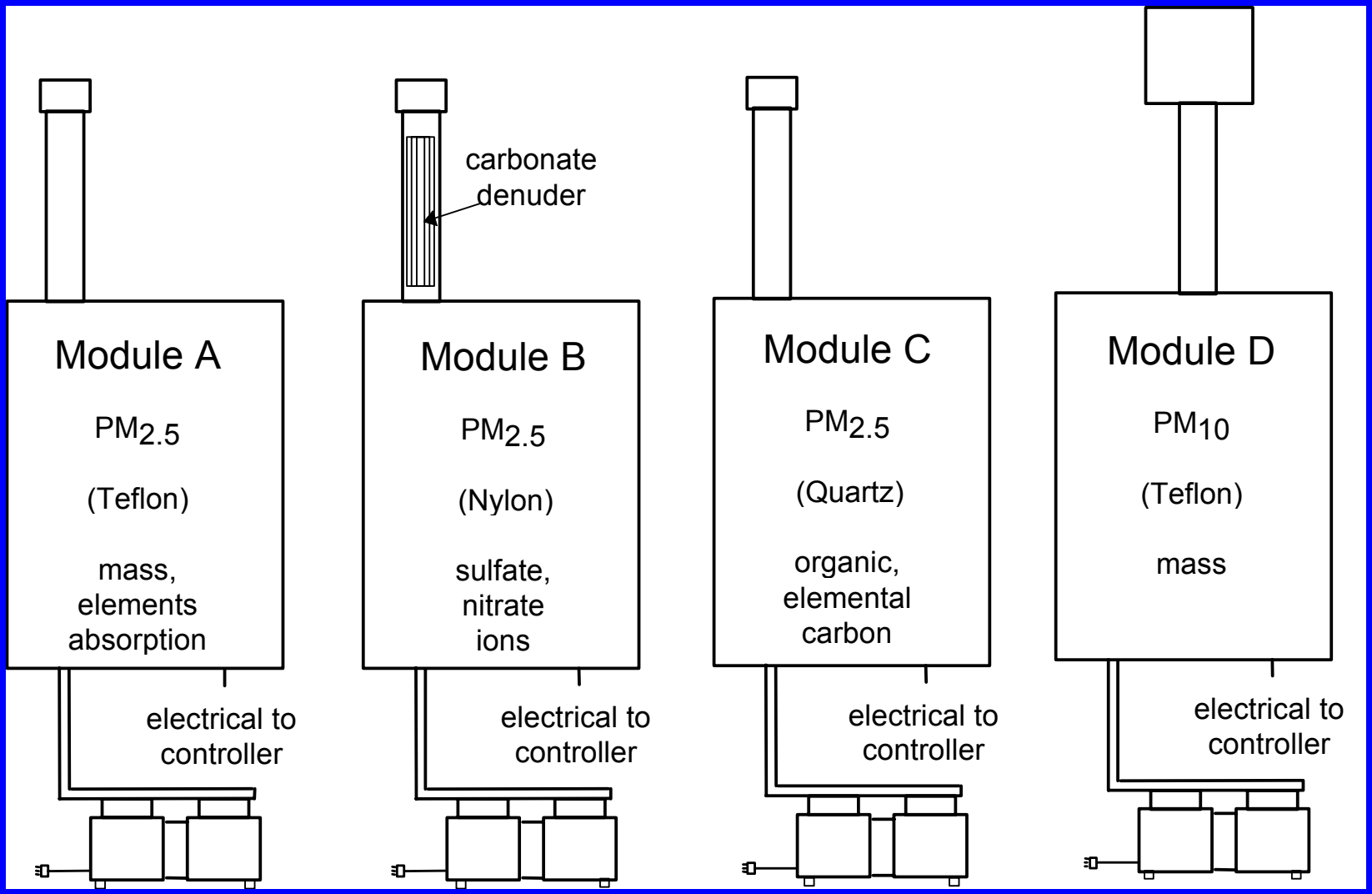
IMPROVE sites 2001 - 146 Sites



- Began with 20 site operating in 1988
- By the end of 2001 110 IMPROVE and 36 protocol sites will be operating
- 16 more sites from Montana to Oklahoma due in 2002

IMPROVE Aerosol Station

IMPROVE Aerosol Monitor Configuration

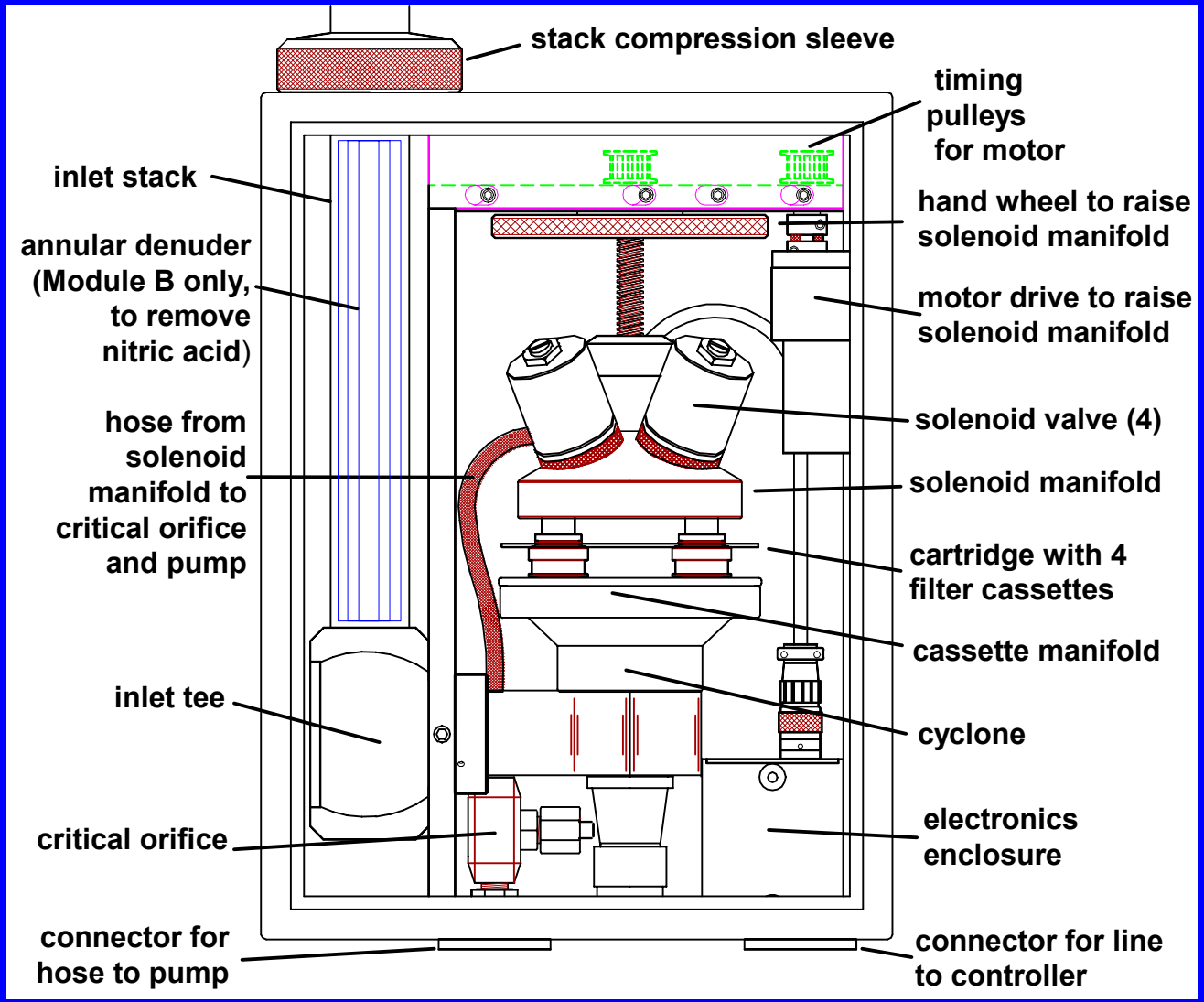


IMPROVE Aerosol Samplers

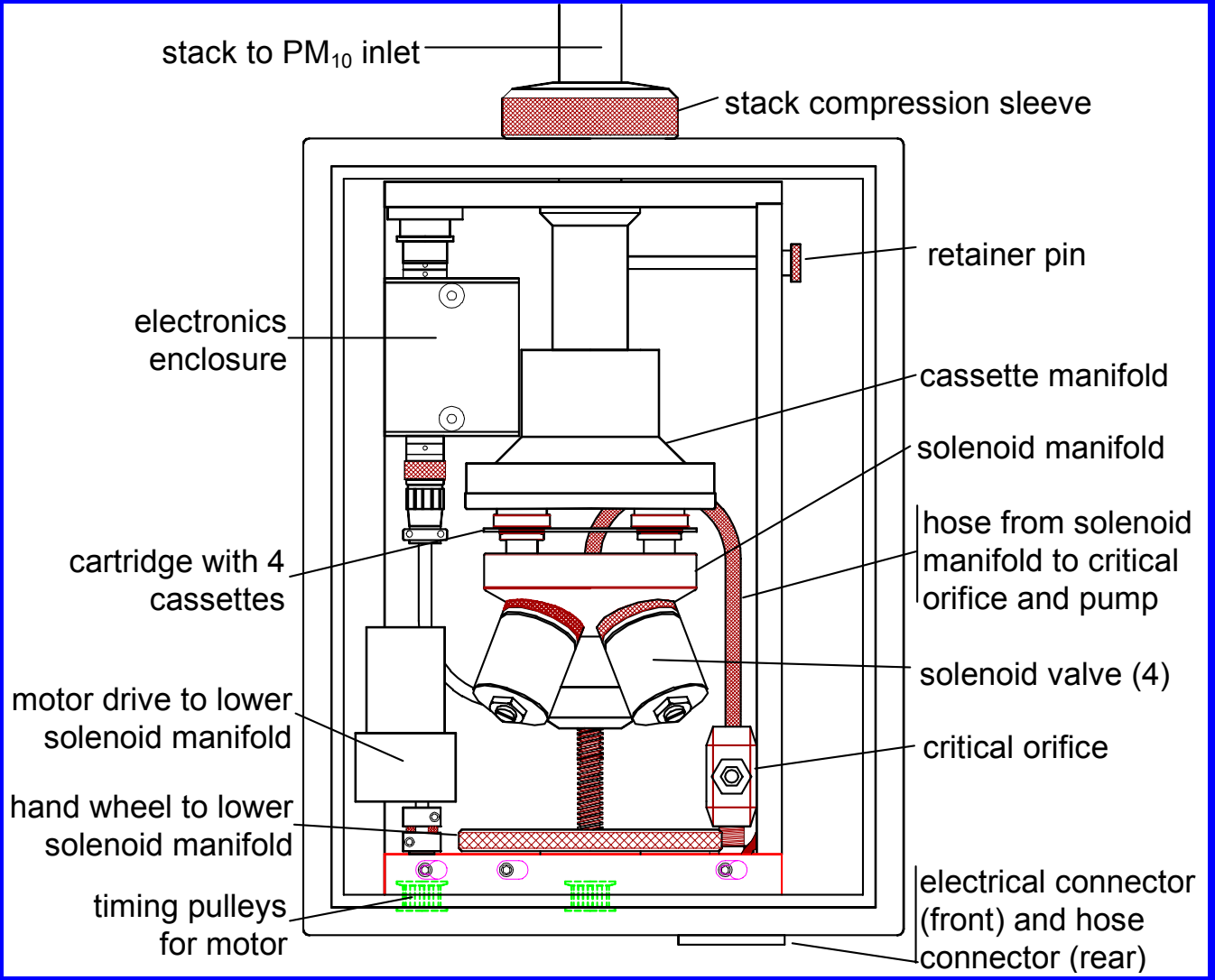
- Four independent sampling modules
- Prior to 2000, two 24 hour samples were collected twice a week, after 2000, samples collected every three days.

Module	Filter	Size	Variable	Analysis
A	Teflon	PM2.5	mass	gravimetric
			Na-Mn	Proton Induced X-Ray Emission
			Fe-Pb	X-ray Fluorescence
			total H	Proton Elastic Scattering
			optical absorption	Hybrid Integrating Plate/Sphere
B	Nylon	PM2.5	sulfate, nitrate	Ion Chromatography
C	Quartz	PM2.5	OC, EC in 8 fractions	Thermal Optical Reflectance
D	Teflon	PM10	mass	gravimetric

IMPROVE modules A, B, C



IMPROVE module D



Manti La Sal near Arches